

Ultra-Lightweight High Efficiency Nanostructured Materials and Coatings for Deep Space Mission Environments, Phase II

Completed Technology Project (2007 - 2009)



Project Introduction

NanoSonic has developed a nanostructured spray self-assembly manufacturing method that has resulted in ultra-lightweight ($< 0.4\text{g/cc}$) textile interconnects for photovoltaic arrays, durable EMI shielding (-70 dB) solar collector membranes with unprecedented flexibility ($> 1000\%$), and multi-layer, high efficiency thermal rejection coatings for deep space missions. NanoSonic has analyzed opportunities for its unique self-assembly processing techniques with the Photovoltaic and Space Environments Branch at NASA GRC. Focus was placed on radiant heat barrier coatings formed as multiple organic and inorganic well-defined segments using spray-based self-assembly processing. The spray technique allows the incorporation of materials required to achieve high coating reflectivity with low absorptivity and high emissivity over large-area NASA structures. The low \square/\square coatings will be transitioned to use on NASA deep space mission structures, near space airships and commercial rooftops and buildings. NanoSonic has also developed ultra low mass density fabric materials with patterned conductive traces capable of conducting high electrical current densities and capable of withstanding extreme thermal (-140

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C to 450

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C) and mechanical environmental conditions required in deep space. Metal Rubber

TM

textiles will be transitioned to large area photovoltaic arrays. Such multifunctional Gossamer materials would provide adequate mechanical support and low loss electrical interconnect network functionalities for power generation arrays.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

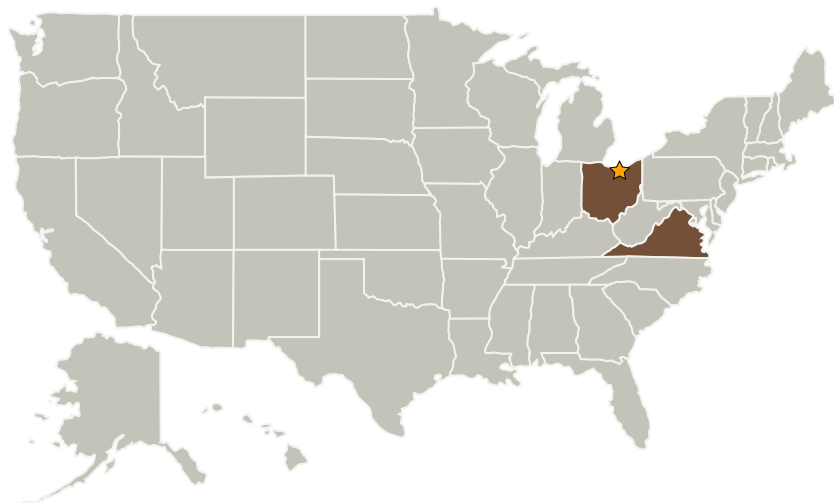
Small Business Innovation Research/Small Business Tech Transfer

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Nanosonic, Inc.	Supporting Organization	Industry	Pembroke, Virginia

Primary U.S. Work Locations

Ohio	Virginia
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Project Transitions

**November 2007:** Project Start**November 2009:** Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.1 Cryogenic Systems
 - └ TX14.1.1 In-space Propellant Storage & Utilization